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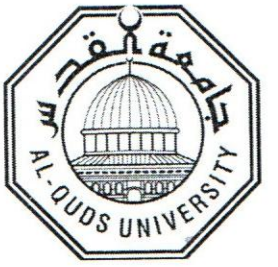

Thesis approval

Learning Progress Monitoring: Towards an Early Warning System

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Abstract:

Huge amounts of data and traces on learning progress are collected in the diverse systems where learning experience is delivered or occurs. This data about learning traces can be complementing to information about learning outcomes and assessment results. In this paper, we implement an analytics engine that will use learning traces to support an Early Progress Warning System (EPWS). Our engine uses data gathered from Learning Management Systems (LMS), Student Information System and Virtual Learning Platforms (Videoconferencing). Based on learning analytics techniques, we focus on providing awareness on how students do, in real time during the course. Providing learning progress monitoring and early progress warning framework, enhance students performance and stimulate them to do better and enables early proactive intervention from teachers and other stakeholders in the educational system. It is important to note that this study is following a qualitative approach and our focus is to produce a proof of concept system.

ملخص الدراسة

تشمل هذه الرسالة على دراسة وتحليل البيانات المتراكمة نتيجة تفاعل الطلاب من خلال بيئة التعليم الالكتروني واستخدامهم للأنظمة المختلفة في التعلم بالإضافة الى اللقاءات الصفية، حيث تعمل أنظمة إدارة التعلم على تسجيل نشاط الطلبة خلال هذه الأنظمة وكثيرا ما يتم تجاهل هذه البيانات المتراكمة خلال العملية التعليمية في رصد نشاط وتقدم الطلبة رغم احتوائها على كم هائل من المعلومات المفيدة لتقييم وتقويم العملية التعليمية، وما يشكله من صعوبة جمع هذه البيانات وتحليلها خصوصا عند وجود أكثر من نظام مختلف خلال العملية التعليمية، وما يستدعيه من مراجعتها جميعا للوصول الى ملخص بسيط عن حالة الطلبة، هنا قمنا بالعمل على تطوير نموذج يعمل على ربط البيانات الصادرة من أنظمة إدارة العملية التعليمية والأنظمة المساعدة في العملية التعليمية وأنظمة التسجيل في الجامعات والمعاهد. مما يساعد على توفر هذه البيانات في مكان واحد يسهل لاحقا عملية دراستها وتحليلها، إضافة لذلك قمنا بتصميم الية تقوم من خلال المعطيات المجمعة حول نشاط الطالب بتصنيف الطلبة حسب تقدمهم وتحدد سبب تأخرهم عن زملائهم ان وجد لديهم أي تأخر بشكل مباشر، ووفرت هذه الدراسة أيضا نموذجا مبسطا للوحة عرض سريعة وسهلة الفهم من خلال الرسومات التوضيحية لتوزيع وتصنيف الطلبة وحالاتهم. مما يوفر السهولة للطلبة والأساتذة على حدٍ سواء في فهم حالتهم الحالية وتقويمها في الوقت المناسب. ما قمنا بتسميته لاحقا بنظام مراقبة أداء الطلبة والانذار المبكر.

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1 Chapter One

Introduction

The main goal of this work is to develop an early progress warning and monitoring framework, which can provide real time assistance for teachers, students, and academic administration departments and decision makers. This framework should help in monitoring the learning process. Section 1.1 introduces the scope of work and the motivation of the thesis; Section 1.2 presents the problem statement of this thesis and the research objectives; section 1.3 summarizes the main contributions; and section 1.4 of this thesis provides an overview of thesis structure and outline.

1.1 Scope and Motivation

The investigations in e-learning domain and the different systems involved in learning progress provide a great opportunity for students to interact electronically with each other as well as with their teachers. Collaboration can be done via innovative ways and several technologies can be employed in the learning process regardless of the original purpose the

technologies were designed for. The term of Virtual Learning Environment (VLE) is used to refer to the on-line interactions between students and teachers during the learning process. There are many software systems available that provide VLE features and services. This software is in either forms, commercial or open source software (OSS). Educational organizations usually face a problem in the integration of their information systems and VLE (Kumar & Dutta, January-June 2011), then they have difficulty to obtain integrated information from these systems since most of them still work isolated without prospects for providing integrated services. The lack of integration between existing academic management systems and VLE systems represents a problem for the educational organizations leading to the data duplication and lack of information coherence (Ricardo & Bernardino, 2010).

Huge amounts of data and traces on learning progress are collected across systems where learning experience is delivered. The growth of data surpasses the ability of organizations to making good use of it. The educational organizations do not extract all useful information from accumulated data usage, however analyzing neglected data can reduce cost, and increase education process efficiency. Learning analytics is concerned with measuring, collecting, analyzing, and reporting of data about learners and their contexts. Making effective use of learner traced data generated across different systems can be a useful indicator about learning progress of students. Teachers and academic administration at the learning institution may use this information to make proper early, and on-time informed advice to learners. This should result in improving the learning delivery, quality and assessment.

Learning analytics concerns measuring, collecting, analyzing and reporting of data about learners and their contexts and traces for purposes of understanding and optimizing learning and the environments where learning takes place (gsiemens, 2010).

1.2 Problem Statement

The mix of systems integrated in learning process, as previously discussed, generate huge amount of data. The Learning Management System (LMS) does not extract the useful and real value information from this data. Educational organizations make small use of the traces made by learners in the process of interacting with learning management system, "neglecting valuable information", although learning management systems track most of user interaction. LMS have a limited log and reporting system. Moreover LMS do not track user activities outside its environment, or within other supporting systems, which indicate on limitation of integrity with other learning management systems and academic management systems. Although student-tracking capabilities are usually included as additional features, the depth of extraction and aggregation, reporting and visualization functionality of these built-in analytics have often been basic or non-existent. This limitation in LMS make it difficult for teachers to track and monitor students' progress (Ferguson, 2012) (Duval, Attention please! Learning Analytics for Visualization and Recommendation, 2011) .

The challenge is to create a unified data store in order to collect different data from learning environment in one place, facilitating the extraction of required information from learning management system and academic management system allowing us to process student data and extract valuable information which can summarize course and student status for teachers

and academic administration and students themselves. The farther step is to build a dashboard not only with useful graphs but also with clear view linked information with learning goals showing summarized information, easy to visualize and define students' status in real time and adding awareness and self-reflection for students, teachers, and stakeholders a timely manner.

1.3 Summary of Contribution

As described in the Problem Statement section above, this work will focus on gathering data and creating a general schema for tracing data collected from learning environment course management systems, and academic management systems or any other systems integrated to the learning process, i.e. virtual class system. Generated schema will allow us to access the progress data and extract self-reflection and awareness information. This result will increase system interoperability.

Gathered data from the learning environment will be analyzed to classify students based on their course interaction, and progress; by determining students' status using following learning indicators: classroom attendance, online time, etc. This allows academic administration to take proper actions to assists students to overcome course failure. The early warning notification system will monitor any lag on student progress, and warn them to take actions to enhance their status within a proper period of time.

This contribution will be demonstrated in a proof of concept prototype of a dashboard component for the learning process. The intended end-users/actors in the dashboard are: students, teachers, and academic administration. The required views and information from the

analyzed data are defined for each intended end user. The dashboard will visualize, and summarize learning process status inside one place, eliminating the need of going through different reports and log forms between various systems, to conclude students' status in proper time to take proper correction measures.

1.4 Summary and Structural Outline

The contribution of this thesis is structured into five chapters that present and highlight our work as follows.

Chapter I introduction; is *an* introduction for the thesis, briefing the problem statement, and summarize thesis contribution.

Chapter II Background and related work; discusses existing technology relates to the online learning systems covering e-learning environment, learning analytics, data visualization, interoperability, and dashboards. Going through researches carried in this field of work that focuses over points related to our work by overviewing their finding..

Chapter III Introducing learning Progress Monitoring and Early Warning; this chapter introduces the early warning framework, by describing collected data using learning process environment, introduces proposed data schema for current framework, and explain student's status definition and classification. In addition, present designed dashboard system.

5 Chapter Five

Conclusions and Future Work

Chapter five summarizes the main findings of this thesis, and gives recommendations for future work.

5.1 Thesis Conclusions

We presented the learning progress monitoring framework, and we have discussed the problem of monitoring students progress in real time based on their interaction within the learning environment. We tried to use all traces left by students and captured by different systems during the learning progress. This framework gives students and teachers the ability to see real time learning status and early warning about students' progress. This framework classifies students based on their progress due to the course time and draws out this information for students and teachers in a usable infographic and charts summarizing course progress. As far as implementation of the framework is concerned, we aimed at stimulating both students and teachers to do better achievement in learning. Through this work we can

enhance learning progress. Moreover the proposed schema can enhance data capturing through learning progress by adding more values for data, which usually were ignored. Classifying students into two groups: good, and bad can also determine where student lag and need to work harder to overcome this lag.

5.2 Recommendations for Future Work

Following the investigation described in this thesis, a number of recommendations could be taken in account. First, we can enhance studies on calculations made to classify students by progress involving more data and indicators for more detailed outputs. Moreover we can add more classification to students' status not only by using bad, or good flag. The second recommendation, after adding new indicators to the progress evaluation and monitoring, we can build dashboard system link with informations and graphs, describing students' status and whole class. Third, this system can be applied on multiple courses and provides information about faculty or whole learning organization providing valuable indicators to the academic administration. Finally, we can utilize this feedback in a different system to enhance the learning process or any other domains such as health, finance, etc.